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What does teaching declaratives tell us about the criteria by which we can judge the developmental importance of treatment outcomes?

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What does teaching declaratives tell us about the criteria by which we can judge the developmental importance of treatment outcomes?

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Abstract
This article uses examples of treatment research on declaratives to illustrate criteria for determining whether a taught behavior is a ''skill'', not just a context-bound behavior and whether the taught skill has associations with other theoretically linked skills as one type of validation evidence. The article uses data from three treatment studies to illustrate the issues and proposed criteria. The article concludes with a call to consumers and producers of treatment research to use the criteria to judge the developmental importance of treatment outcomes.

Keywords: *declaratives, developmental importance of treatment outcomes, validation*

INTRODUCTION

The treatment of declaratives is a useful pedagogical case in the discussion of how we might judge the developmental importance of treatment outcomes. The frequent use of the declarative function is a skill that is only inferred from what is observed (i.e., an example of a construct). Additionally, this skill is particularly difficult to teach, as conceptualized using one of our most widely recognized theories of how teaching works. Behaviorists will recognize this theory as transfer of stimulus control theory. In this article, we call the teaching approach that grows out of transfer of stimulus control theory ''direct teaching''. There are clinical researchers who have attempted to teach declaratives using a ''direct teaching'' model, but who inadvertently teach a behavior that only resembles declaratives in form. Because such behaviors often return to baseline after treatment is withdrawn or do not show far generalization, results of such studies reinforce the beliefs of a second group. The members of the second audience are people who doubt that treatments can really increase the frequency of skills such as declaratives because they correctly reason that the presumed mechanisms by which ''direct teaching'' work do not fit the case of skills such as declaratives. Such people are a subset of a larger, third group who believe that educational treatments primarily affect superficial outcomes (i.e., those that are not developmentally important). We have written this article with the hope that it will stimulate deeper investigation and thought relevant to critiquing, designing, and testing the efficacy of treatment on developmentally important outcomes. We have included details (definition, importance, why declaratives are not likely to be taught be direct teaching, etc.) about declaratives to illustrate why the issues are important.

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DEFINITION OF DECLARATIVES

Declaratives are child-initiated, intentional communication acts used to convey positive affect or interest about an object or event to another person (Wetherby & Prizant, 2001; Yoder & Warren, 1999). By ''intentional communication'' we mean (a) gestures or non-word vocalizations combined with coordinated attention to object and message recipient, (b) conventional gestures (e.g., distal points, head nods) and attention to message recipient, or (c) symbol use, such as words or sign language (Bates, Camaioni, & Volterra, 1975; Wilcox & Shannon, 1998; Yoder & Stone, 2006). We understand that ''intention'' is not directly observable. However, it is extremely important to distinguish an infant's behavior from which we can infer the infant's feelings and needs (e.g., newborn cry) from meaningful behavior that is directed to a message recipient and is about a particular referent. Coordinated attention is one way to distinguish these two classes of behavior. Coordinated attention to object and person involves showing attention to the referent being communicated about (i.e., the content of the message) and the person to which communication is being directed (Sugarman, 1983). Attention to person and object can occur simultaneously (e.g., show object to adult) or sequentially (e.g., point to object and then look at adult). Examples of declaratives include (a) 2- or 3-point

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gaze shifts to or from an object and a person with a smile, showing an object to the adult, pointing to an unattainable object (e.g., a plane) and looking at the adult, (b) pantomiming what just occurred and looking to the adult, and (c) labeling an object that the child is holding (Crais & Day, 2000).

A contrasting type of intentional communication is a request. The same behavior (e.g., a point and look to adult) used to convey a declarative can also be used to convey a request. The difference is that a request ''asks'' for an object (e.g., a cup of juice) or action (e.g., pour the juice). The consequence of a request is access to the object or action, which in the above examples would be a cup of juice. In contrast, a declarative calls the adult's attention to a referent without asking for the object or for an action to be performed on the object. The consequences of declaratives are thought to be adult attention or adult labeling of the referent. These consequences are thought to be particularly social (Mundy & Crowson, 1997). For this reason, some have considered the declarative pragmatic function as ''social''; while considering the imperative or requesting pragmatic function as ''instrumental'' (Bates *et al*., 1975).

IMPORTANCE OF DECLARATIVES

There are at least three reasons that increasing the frequency of declaratives is considered important in many children with intellectual disabilities and autism spectrum disorder. First, declaratives are one of the three primary pragmatic functions for prelinguistic and early linguistic communication (Wetherby, Cain, Yonclas, & Walker, 1988). Between 9 to 18 months, typically developing children use an average of about 1 declarative per minute during contexts that attempt to evoke declaratives (Mundy *et al*., 2007). Children who do not show much use of this primary function are not using their communicative acts for one of the primary functions that most children convey.

Second, children with autism spectrum disorders tend to use declaratives much less frequently than other children who are matched on several important variables (Charman, 2003; Mundy, Sigman, & Kasari, 1990). One study compared children with autism to children with other developmental disorders who were matched for chronological age, mental age, number of words used, and cognitive developmental quotient (Stone, Ousley, Yoder, Hogan, & Hepburn, 1997). The effect size of the group difference on frequency of declaratives was quite large (Cohen's d of 1.36). The declarative deficit in the autism group was apparent even when the total number of communication acts was controlled. The declarative deficit in children with autism may occur because (a) the primary consequence for declaratives is social and autism is, at least in part, a social disorder (Mundy, 1995) and (b) the referent of declaratives are objects or events of interest and one characteristic of autism is restricted interests (American Psychiatric Association, 1994).

Third, individual differences in the frequency of declaratives are positively associated with later individual differences in language level. The longitudinal association of declaratives with later expressive language has been replicated in children who are developing typically, who have intellectual disabilities (Mundy, Kasari, Sigman, & Ruskin, 1995; Sigman & Ruskin, 1999; Ulvund & Smith, 1996; Yoder & Warren, 2004) and who have autism spectrum disorder (Bono, Daley, & Sigman, 2004; McDuffie, Yoder, & Stone, 2005; Mundy *et al*., 1990; Sigman & Ruskin, 1999). The average effect size of these associations was R square = 0.16 (SD = 0.085), 0.20 (SD = 0.10), and 0.25 (SD = 0.11) in children with typical development, with intellectual disabilities, and with autism spectrum disorders, respectively. The association of declaratives to later language may be particularly large because the frequency of declaratives may reveal the degree to which children are motivated by social consequences (Mundy, 1995). This is relevant to language development because some have speculated that a desire to share the contents of mind is a primary motivation for acquiring language (Bloom, 1993).

IT MAY BE DIFFICULT TO ''DIRECTLY TEACH'' DECLARATIVES

Perhaps one reason treatment work on declaratives is relatively new is that it is difficult to see how direct teaching could benefit this important outcome. ''Direct teaching'' may be thought of as the conscious manipulation of antecedent and consequent events to change the behavior of interest (Wolery, Ault, & Doyle, 1992). Because our definition of declaratives asserts that declaratives are child-initiated, not prompted, the use of manipulated ''antecedents'' may seem counter-productive. However, in the direct teaching model, children are taught to use communication behaviors that will eventually become declaratives (we will call these ''pre-declaratives'') by using prompts for communication such as ''What do you hear?'' or ''What do you see?'' when environmental events that are thought to stimulate the child's interest or positive affect occur. After seeing fluent prompted pre-declarative use, the

teacher fades the verbal prompts for pre-declaratives. As prompt-fading occurs, the teacher differentially reinforces pre-declaratives under the new stimulus conditions, the interesting objects, or events. In this way, the stimuli influencing the children's use of (pre-)declaratives hopefully become transferred from the verbal prompts to the environmental events the children find interesting.

There are two problems with this approach. First, behavioral learning theory tells us that transfer of stimulus control occurs because the desired behavior is *differentially* reinforced under the new stimulus conditions (Wolery, Bailey, & Sugai, 1988). Presumably, the ''reinforcer'' for genuine declaratives is adult positive attention (Mundy, 1995). To differentially apply adult positive attention contingent on the use of declaratives, one would have to provide neutral, negative, or no attention to periods when the child did not use declaratives or its approximations. However, teachers cannot do this. If we tried, we would very infrequently provide positive attention to our students with autism! Second, providing environmental events that children find interesting or ''worth declaring about'' is not as easy as it would seem. We use ''unexpected events'' to evoke declaratives in tests. However, clinical experience indicates that regular use of such events results in a reduction in the evocative effect on children's declaratives.

As the reader will see near the end of the article, we are not arguing that declaratives are not teachable. We *are* arguing that the methods that facilitate the development of true declaratives may be fruitfully conceptualized as ''indirect'' teaching. Before we indicate what we mean by *indirect* teaching, we present the results of three studies that present evidence relevant to judging whether a treatment can facilitate declaratives in children with disabilities.

THREE EXAMPLE STUDIES THAT HAVE SHOWN THAT DECLARATIVES CAN BE TAUGHT

The following is a set of brief descriptions of three randomized control trials in which the treatments have facilitated a generalized, maintained skill that we will argue represents increased use of declaratives. In this article, we are using the term ''generalization'' to mean a demonstration that the behavior change that is presumably reflective of the trained skill occurs in nontraining conditions (Stokes & Baer, 1977). We acknowledge that our use of the term is not strictly how traditional behaviorists have used it (Johnston & Pennypacker, 1993; Skinner, 1953). We have used the term ''generalization'' for lack of a better term and because many contemporary writers have used the term to mean the more general, pragmatic meaning that we intend to convey. Most readers will acknowledge that there are genuine individual differences among people that virtually define us as individuals. These individual differences are stable across contexts and time. One of these is a ''tendency to'' or an ''ability to'' use declaratives.

The three example studies have been described in detail in the published literature (Yoder & Stone, 2006; Yoder & Warren, 1999, 2002). The first two studies involve children with intellectual disabilities (Yoder & Warren, 1999, 2002) and the third involves children with autism spectrum disorders. In each study, the children began treatment in the prelinguistic stage of communication development. In each study, random assignment of participants created pre-treatment equivalence between groups on over 20 pre-treatment variables that are often associated with later individual differences in declaratives (e.g., mental age, parental responsivity, severity of disability, frequency of requests and declaratives, and play level). ''Treatment effects'' were inferred when between-group differences, not just pre to post changes, occur in at least a subsample of participants that can be described by a particular pre-treatment variable. In each study, treatment group differences were statistically significant and clinically noteworthy.

In Yoder and Warren (1999), 58 toddlers (mean age = 23 months; SD = 4 months) with intellectual disabilities began treatment using a mean of 11 (SD = 10.5) declaratives in a structured assessment context that lasted an average of 20 minutes (i.e., an average rate of about 1 declarative per 2 minutes). Children were randomly assigned to Prelinguistic Milieu Teaching (PMT) or a contrasting treatment that was designed to be a benign control group. If parents were relatively responsive to their children's communication acts at the pre-treatment period, children assigned to the PMT group showed more generalized declaratives at post-treatment and 6 month follow-up than those assigned to the other treatment group. In response to these findings, Yoder and Warren added responsivity training for parents to the PMT model to create *R*PMT (i.e., Responsive Education and Prelinguistic Milieu Teaching).

In Yoder and Warren (2002), 39 toddlers (mean age = 22 months, SD = 4 months) with intellectual disabilities used an average of 14 (SD = 12) declaratives at the pre-treatment period during a structured assessment that lasted an average of 20 minutes (i.e., rate of about 2 declaratives every 3 minutes). Children were randomly assigned to RPMT or a business-as-usual control group. If children began

treatment with relatively few declaratives, children assigned to the RPMT grew faster on declaratives than those in the control group. One interpretation of these data is that those who needed to learn to use more declaratives learned to do so in RPMT.

In Yoder and Stone (2006), 36 preschoolers (mean age = 32 months; SD = 6 months) with autism spectrum disorders began treatment with an average of 3 declaratives (SD = 3) during a structured assessment that lasted about 20 minutes (i.e., rate of about 1 declarative every 6 minutes). The children in this sample who used the *most* declaratives at the pretreatment period actually used fewer declaratives than the children in the Yoder and Warren (2002) sample who used the *fewest* declaratives at the pretreatment period. The children in the Yoder and Stone study were randomly assigned to either RPMT or the Picture Exchange Communication System (PECS; Bondy & Frost, 1994). As expected, children with relatively many declaratives (i.e., 7 or more across 2 communication samples) had more generalized declaratives at the post-treatment period if they were treated with RPMT than those treated with PECS. Interestingly, children with very *few* declaratives at the pre-treatment period (i.e., 1 or fewer across 2 communication samples) had more generalized declaratives at the post-treatment period if they were treated with PECS than with RPMT.

THE SKEPTICS' CONCERNS

A common concern in behavioral research is whether treatments truly alter an individual's skill level, or simply teach a specific response within a narrow set of circumstances. Such skepticism serves well those professions that wish to use scientifically based treatments. Attempting to address this concern strengthens the basis by which we can assure insurance companies and policy-makers that our treatments work. Johnson (1988) referred to the phenomenon of using a special way of communicating in well-defined circumstances as a ''therapy register''. Others have referred to this type of behavior change as a superficial change. We will refer to this type of behavior as ''context-bound''. One way to restate the above concern is that context-bound behavior is under the control of such narrowly defined stimulus conditions that it is unlikely that naturalistic conditions will elicit or sustain the new behavior. If children are learning a context-bound behavior, then we would expect the generalization of trained behaviors to be weak or non-existent or to reverse toward baseline levels once treatment is removed (Yoder & McDuffie, 2006).

Two studies that use the ''direct teaching'' method to attempt to teach ''declaratives'' illustrate the concern. Authors of both studies teach the child to use behaviors that can be used to declare (e.g., points to object and look at adult), but close examination of the results support an inference that they have changed context-bound behaviors. In Buffington, Krantz, McClannahan, and Poulson (1998), an adult provides a verbal (e.g., ''Let's talk about something on the –'') and nonverbal (e.g., presence of a pinwheel) prompt for the desired behavior. The desired child response is very well defined (e.g., saying ''look'' while looking at and pointing to pinwheel). If the child's response is incorrect, incomplete, or absent, the adult models the correct response. If the child still provides no response, the adult provides a physical prompt for the gestural component of the expected child response (e.g., adult physically manipulates the child's hand into the shape of a point and directs that point toward the referent) and asks the child to imitate the desired verbal response (e.g., ''Say 'look' hair''). Reinforcement unrelated to the meaning of the communication message (e.g., token reinforcement) is provided contingent on complete, correct responses.

In the study by the Buffington and others, prompts used during the ''generalization'' testing sessions were extremely similar or identical to those used in the treatment sessions (Buffington, *et al*., 1998). For example, when *teaching* the child to say ''Look!'', the adult said ''Let's talk about something on the pinwheel'' while holding the pinwheel. When *testing* the child's ''look'' response, the adult said, ''Find something on the globe'' while holding the globe. Because the function of the verbal stimulus and form of the nonverbal cue were so similar between teaching and testing conditions, only near (as opposed to far) generalization was tested. One can reasonably question whether the child's saying ''look'' while looking at the object in the generalization session is really functioning as a declarative. Perhaps the child was merely responding to the stimuli used in the treatment sessions because the child expected token reinforcement for doing so. No maintenance data were presented so we do not know whether the behavior reversed toward baseline after training ended.

In the second example study, Whalen and Schreibman (2003) considered child engagement with a preferred toy for more than 10 seconds as an opportunity for declaratives. If a target behavior did not occur within 10 seconds of the previous instance of a target behavior, the preferred toy was removed. After two such instances, the child was physically prompted to move the object and to look at the adult's

eyes. The adult concurrently says, ''show'' and points to her eye as an additional prompt. As gaze shifting increases, prompts are faded.

The Whalen and Schreibman study tested far generalization. They altered three stimulus dimensions (location, person, materials) simultaneously in several types of generalization sessions. Interestingly, generalization was shown in 2–3 of the 4 participants, depending on the type of generalization session used. Unfortunately, the timing of the change in target behaviors in the generalization session relative to the onset of the treatment phase was not clearly presented in the article. This makes it unclear whether the data met the criteria used to infer that the treatment caused the changes in the generalized dependent variable (Kazdin, 1982). Additionally, the behavior change that the authors called declaratives reversed towards baseline levels 3 months after training ended in 3 of the 4 cases. True development should not reverse after treatment is withdrawn. Strong replication is needed in multiple baseline designs to infer a functional relation between the treatment and the declarative-like behavior. Therefore, the follow-up generalization data from the one participant whose declarative-like behavior did not return toward baseline levels is insufficient for inferring a functional relation between the treatment and the generalized dependent variable.

CRITERION FOR JUDGING WHETHER THE BEHAVIOR CHANGE REPRESENTS A SKILL

Using the data from the five previously described studies, we can illustrate how we might determine whether we have taught a skill versus whether we have taught a context-bound behavior. We can do this in the context of treatment studies by demonstrating (a) far generalization, (b) stable individual differences after treatment, and (c) maintained levels or continued growth in the dependent variable months after treatment ends (Yoder & McDuffie, 2006).

Skills show far generalization

The first criterion of whether we have taught a skill involves the measurement of far generalization. A test of far generalization involves using a measurement context that is different in several ways from the treatment sessions. The types of stimuli that we should attend to when designing these generalization sessions are those that presumably signaled the child to use the target behavior during the treatment. Traditionally, such stimuli have been divided into location, material, and person. However, clinical experience indicates that the salient aspects of the circumstances that may stimulate the child to use a new way of communication may also be described by the activity and by the interaction style used by the person administering the generalization session. For example, if the adult administering the generalization session uses the same prompt type and/or similar rewards that the interventionist used in treatment sessions, it weakens the test of generalization. Similarly, if materials are changed (e.g., from car to ball) but the activities used are very similar (e.g., rolling the object), it weakens the test of generalization. A test of far generalization occurs in a different location from that used in the treatment, uses a person other than the interventionist who is not using the prompts or rewards used during treatment sessions, and uses activities and materials that differ from those used in treatment. We acknowledge that one can and should program for generalization. We also acknowledge that some radical behaviorists (e.g., Johnston and Pennypacker, 1993) suggest that we should *never* expect behavior changes due to treatments to occur in untrained contexts. However, we disagree with this extreme point. Indeed, for us to know whether what we have taught is something that children carry around with them by virtue of having changed the structure or functioning of the brain, we need to know whether the participants in our studies can use the newly acquired skill under conditions that differ from contexts in which treatment occurs on a number of dimensions.

In 2 of the 3 example randomized control trials, treatment effects at post-treatment or follow-up were seen on declarative-like behaviors that were assessed in such far generalization conditions (Yoder & Stone, 2006; Yoder & Warren, 1999). In Yoder and Warren (1999) the effect was seen in an examiner–child responsive interaction session in which the examiner was told not to use any prompts to communicate, but was told to play responsively with the child. The interaction occurred around a standard set of toys that were not used during the treatment. For example, no wind-up toys or fun toys in clear, but difficult to open, containers were used because such environmental arrangement strategies were used in treatment sessions. In Yoder and Stone (2006), the treatment effects on declaratives was seen in both a structured communication sample (i.e., Early Social Communication Scales; Mundy, Hogan, & Doehring, 1996) and in a responsive examiner–child play session as described above. Again, neither used the child's interventionist to administer the session and both used materials and activities not used in treatment. In the Yoder and Warren (2002) article, a strong claim for generalization cannot be made

because the effect on declaratives was seen only in the parent–child free play sessions. Because parents in the RPMT group were trained, they were technically interventionists. This reduces the extent to which one can reasonably claim that children used their newly learned declaratives outside of interactions with interventionists.

Skills show stability over time

Used alone, generalization is not sufficient to determine whether the behavior changed after treatment constitutes a new skill. A second criterion by which we judge whether we have taught a skill involves stability of individual differences over time. That is, after the treatment phase ends, individual differences in skills should be relatively stable over time. In contrast to how ''stability'' is used when speaking about data collected within single-subject experimental designs, ''stability'' in the group design context means a high positive correlation between scores on the same construct at 2 measurement periods. For the purposes of assessing the effectiveness of a treatment in teaching a skill, we are interested in whether there is stability in individual differences from the period at which treatment effects are first detected (e.g., immediately after the treatment phase ends) to later periods that occur several months after the treatment phase ends.

In 2 of the 3 example studies, the treatment effect was detected at the post-treatment period (Yoder & Warren, 2002; Yoder & Stone, 2006). In those two studies, stability was large to moderate between post-treatment to 3-month follow-ups ($r = 0.7$, Yoder and Warren, 2002) and to 6-month follow-ups ($r = 0.6$, Yoder & Warren, 2002, $r = 0.5$, Yoder & Stone, 2006). Stability of declarative-like behavior after the treatment effect was detected could not be addressed in the Yoder and Warren (1999) study.

Skills maintain after being taught

A final criterion by which we can judge whether we have taught a skill as opposed to a context-bound behavior involves the examination of post-treatment maintenance of skill. If the behavior change that our treatment causes represents a change in skill level, then the levels (e.g., frequency of use) of the behavior we use to infer a change in skill level should not drop after the treatment phase ends. Maintenance can only be determined if there is follow-up data. In the Yoder and Warren (1999, 2002) and the Yoder and Stone (2006) studies, 67%, 59%, and 74% of the participants gained or maintained the frequency of declarative-like behavior from post-treatment to the 6-month follow-up, respectively. In fact, the mean levels of declarative-like behavior rose to a statistically significant degree from post-treatment to follow-up periods in the Yoder and Warren (1999) and Yoder and Stone (2006) studies, $t(56) = 3.2$; $p = 0.002$, $d = 0.43$; $t(34) = 2.06$, $p = 0.05$, $d = 0.35$, respectively. The mean number of declaratives used from post-treatment to 6-month follow-up did increase in Yoder and Warren (2002), but the gain was not statistically significant, $t(38) = 1.7$; $p = 0.09$, $d = 0.25$. That is, on the whole, the frequency of declaratives did not decrease from post-treatment to 6 months after treatment in any of the 3 studies.

In the preceding paragraphs, we described three criteria we may use to determine whether a treatment has taught a skill: (a) a test of far generalization, (b) stability of individual differences from post-treatment to follow-up, and (c) maintenance of skills over time. However, even if our data meet the criteria for changing skill level, we need other criteria by which we can judge whether the skill is really the construct of interest (i.e., in this case an increase in the declarative function). These are matters of construct validation.

A BRIEF TUTORIAL ON CONTENT AND CONSTRUCT VALIDATION

Cronbach and Meehl (1955) asserted that there is value in clarifying constructs which are evidenced by performance but distinct from it and that new ''tests'' can be better than what is considered a ''gold standard''. Geisinger (1992) indicated that correlations with another measure of the same construct (i.e., criterion-related validation) had early appeal to some because one did not have to buy into a particular theory to accept the validation evidence. But a more current conception indicates that reliance on criterion-related validation is not enough (Geisinger, 1992; Guion, 1977). Whether concurrent or predictive, criterion-related validation has limited value unless the criterion measure (i.e., gold standard) has well-established construct validity, which is relatively rare.

Current conceptions of validation are primarily theory-driven. Here, we will highlight two aspects of the validation process: content validation and construct validation. First, content validation is professional judgment about the relevance of the test content to the content of a particular construct of interest and about the representativeness with which an item or task content covers that domain of interest (Messick, 1989). Applied to observational measures, the ''items'' are types of behaviors used as signs of the construct.

Next, current construct validation methods use correlational, group, or experimental studies to test hypotheses regarding whether the measure of the construct of interest has theoretically predictable associations, group differences or changes after treatment. This system of *a priori* associations, differences, or manipulations is called the nomological net (Cronbach & Meehl, 1955). Confirmation of predictions provides support for that particular use of the score (i.e., supports construct validity). Unpredicted findings weaken the evidence regarding the value of the proposed use of the test score. In general, the validation process is an on-going one. No one association, group difference, or treatment effect is sufficient to ''establish'' validity for a particular interpretation of a test score.

APPLICATION OF THE CURRENT CONCEPTUALIZATION OF CONSTRUCT VALIDATION TO DECLARATIVES

When applied to observational coding systems, content validation judgments can be conveyed via consensus of peer-reviewed definitions of the construct of interest (i.e., declaratives in our case). In the three positive examples, the definition used for ''declaratives'' is based on those published by other content experts (e.g., Bates, 1979; Mundy *et al*., 1996; Wetherby & Prizant, 2001). A very important aspect of this definition is that the instances of so-called ''declaratives'' are used in a pragmatically appropriate manner.

For the definitions to yield interpretable data, it is important that this seemingly slippery judgment be made with strong inter-observer reliability. That is, we want to know whether highly trained observers can (a) identify the presence of an intentional communication act, (b) distinguish whether it is self-initiated, and (c) indicate whether it is used in a way that fits our definition for the declarative pragmatic function. In all three studies the inter-observer reliability for declaratives was over 0.90.

In addition to measuring content validity, informed readers will want to know whether we used ''gold standard'' measures of declaratives. Some readers might consider the Early Social Communication Scales (ESCS) (Mundy *et al*., 1996) or the Communication and Symbolic Behavior Scales (CSBS) (Wetherby & Prizant, 2001) gold standard measures of declaratives. Yoder and Warren (1999) and Yoder and Stone (2006) found treatment effects on declaratives in the CSBS and ESCS, respectively.

However, other readers may believe that the field does not have gold standard measures of declaratives. Therefore, we used Cronbach and Meehl's nomological net logic to collect evidence relevant to judging whether the skill our treatments changed is declaratives. As mentioned earlier, one theoretically predictable association is the one between post-treatment declaratives and follow-up expressive language. This is only one of the theoretically predictable associations in the nomological net for declaratives. Granted, there are possibly non-causal explanations for the association. However, as a start to the construct validation of what we call ''declaratives'', we found that post-treatment declaratives were positively associated with parent-reported productive vocabulary size ($r = 0.52$ and 0.42, Yoder & Warren, 2002; Yoder & Stone, 2006, respectively) and the number of different words used in communication samples ($r = 0.66$ and 0.42, Yoder & Warren, 2002, Yoder & Stone, 2006, respectively) measured 6 months later. This association could not be tested in the Yoder and Warren (1999) study.

PROPOSED MECHANISMS BY WHICH TREATMENTS MAY INDIRECTLY AFFECT DECLARATIVES

As we have asserted earlier, there is reason to suspect that we cannot directly teach declaratives. However, the three randomized control trials and the data we have just presented support a conclusion that treatments can facilitate declaratives. We now propose several mechanisms by which children may be *indirectly* taught to use declaratives. Here we posit that (a) prompting and functionally reinforcing children to request helps them learn to use coordinated attention to object and person to communicate, (b) pairing functional rewards with social rewards may teach some children that social interactions are rewarding, (c) teaching children object play skills may result in children finding more events/objects of interest in the natural environment, and (d) modeling declaratives may teach some children to use newly acquired communicative behaviors to declare. The result may be the acquisition of new ways to communicate and a generalization of these new forms to declare interest in objects the child has recently discovered, in order to make social contact with someone whom the child has recently found rewarding.

The first of these mechanisms is transfer of stimulus control and was described when we discussed ''direct teaching''. An example is when the child looks at bubbles and grunts. The adult physically prompts the child to point to the jar. The child learns to point to the bubbles to request the jar. The adult gives the jar to the child.

We would not expect pointing to the jar to generalize to declaratives if the child does not

experience social attention as rewarding. Pairing the functional rewards with social rewards may teach the child that social interactions are rewarding. For example, the hugs and laughter from the teacher paired with seeing bubbles float by may teach the child that hugs and shared laugher are pleasant.

However, children will not declare unless they find the world around them interesting. Most children communicate about objects they can manipulate, such as toys (Bloom & Lahey, 1978). Because some children, particularly children with autism, have very restricted interests in objects, these children may benefit from adults teaching them what is interesting about objects and how to play with such objects. Kasari, Paparella, Freeman, and Jahromi (2008) found that a play treatment had about equal long-term benefit on declaratives as a declarative treatment and both were better than a randomized control group in preschoolers with autism.

Finally, adults might increase the probability that children will generalize the behaviors recently learned via requests by using the same newly learned communication behaviors to declare. We know from much observational learning literature that children do learn from demonstration, even when they do not immediately imitate the adult models (Bandura, 1977). For example, assume the child already uses a point to request. The adult points to a plane flying over. The next time a plane flies over, the child points to the plane. This will not happen after each model, for every child. However, Siller and Sigman (2002) found an exceptionally strong positive association between individual differences in parents' use of nonverbal declaratives with their 4-year-old children with autism and their children's use of declaratives one year later.

COORDINATED ATTENTION TO OBJECT AND PERSON AS A FUNCTIONAL CLASS

The notion that children may acquire new behaviors via requesting and generalize these to declaratives may help explain how PECS facilitated declaratives in children with almost no declaratives at the pretreatment period in the Yoder and Stone (2006) study. In this study, symbols used during PECS instruction for the toys in the assessment contexts were available for children in both treatment groups. One may reasonably hypothesize that children in the PECS group used the symbol-exchange to declare, while children in the RPMT group used some other form to convey declaratives. To test this hypothesis, we used a group (PECS vs. RPMT) by type of behavior (non-PECS coordinated attention, symbol use, and PECS use) mixed ANOVA with proportion of declaratives conveyed by the named behavior as the dependent variable (Taylor, McMahon, & Yoder, 2005).

Contrary to the above hypothesis, the results showed that the type of behavior used to declare did not differ by treatment group (i.e., there was no interaction effect for group × type of behavior used). Additionally, there was a clear indication that children in both groups conveyed declaratives using only a small number of forms, $F(2,35) = 30.06$, $p < 0.001$, eta square = 0.46. Specifically, the proportion of declaratives conveyed by non-PECS coordinated attention to object and person (M = 53% of declaratives; SD = 42%) was greater than that conveyed by talking (M = 13% of declaratives; SD = 27%). Importantly, *no* children in either group used symbols (used during PECS instruction) to declare. Because the only type of coordinated attention to object and person that was taught to children in the PECS group were PECS exchanges, these data are consistent with the hypothesis that teaching one form of coordinated attention (i.e. PECS) can generalize to other forms (non-PECS coordinated attention). This finding supports the hypothesis that children can learn the general lesson that it is important to attend to the object or event that one is communicating about and to the intended message recipient even when they are directly taught only one way to do this.

CONCLUSION

We have attempted to show that treatments can address important developmental outcomes even when deficits in the outcome (e.g., declaratives) partly define the disability (e.g., autism). However, it should be noted that we have presented only one study on children with autism. The other two involve children with intellectual disabilities who have less trouble learning to declare. Regardless, the criteria we have applied are ones that psychological and educational leaders have been proposing for years. We bring them up in this context, because we hope to inspire current consumers and producers of educational or psychosocial treatments to use the criteria to evaluate whether the results of treatment studies are developmentally important. We hope that treatment researchers will strengthen the potential impact of their studies by attending to the construct validation, stability, generalizability, and maintenance of their outcomes. Future studies may show that it is more difficult to show large gains on such outcomes than it is on variables measured only in treatment sessions. However, we need to balance the size of the changes we can show against the developmental meaningfulness of our outcomes

when judging the degree to which treatment studies add to our body of empirically supported treatments.

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